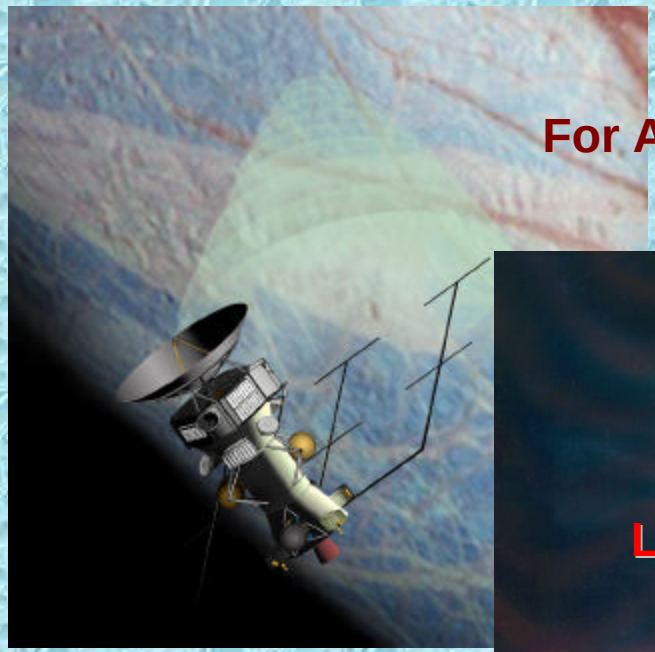
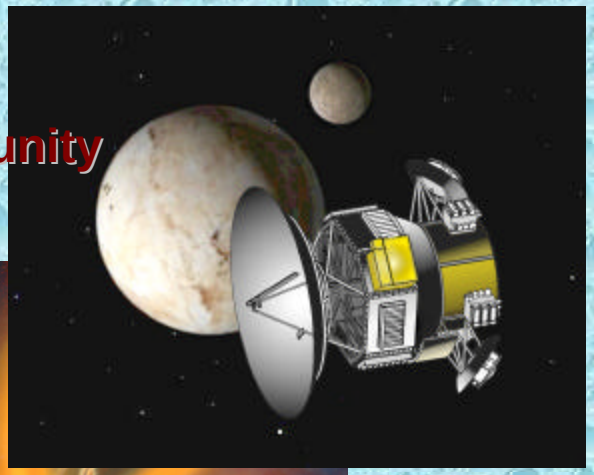
Deep Space Systems Program
Mission Overview





For Announcement of Opportunity
Preproposal Conference

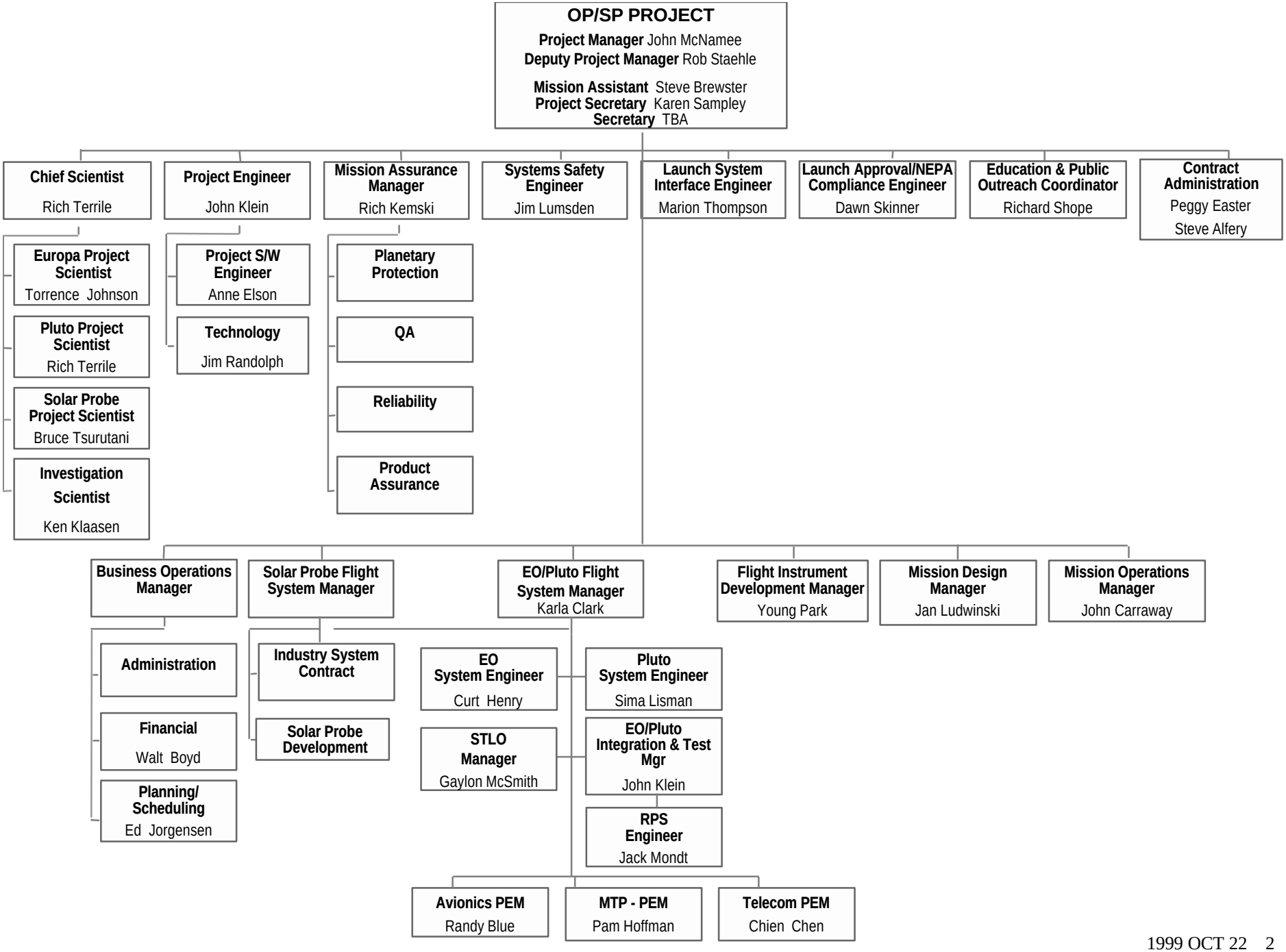
Europa Orbiter
Pluto-Kuiper Express
Solar Probe

Lunar & Planetary Institute
Houston, Texas

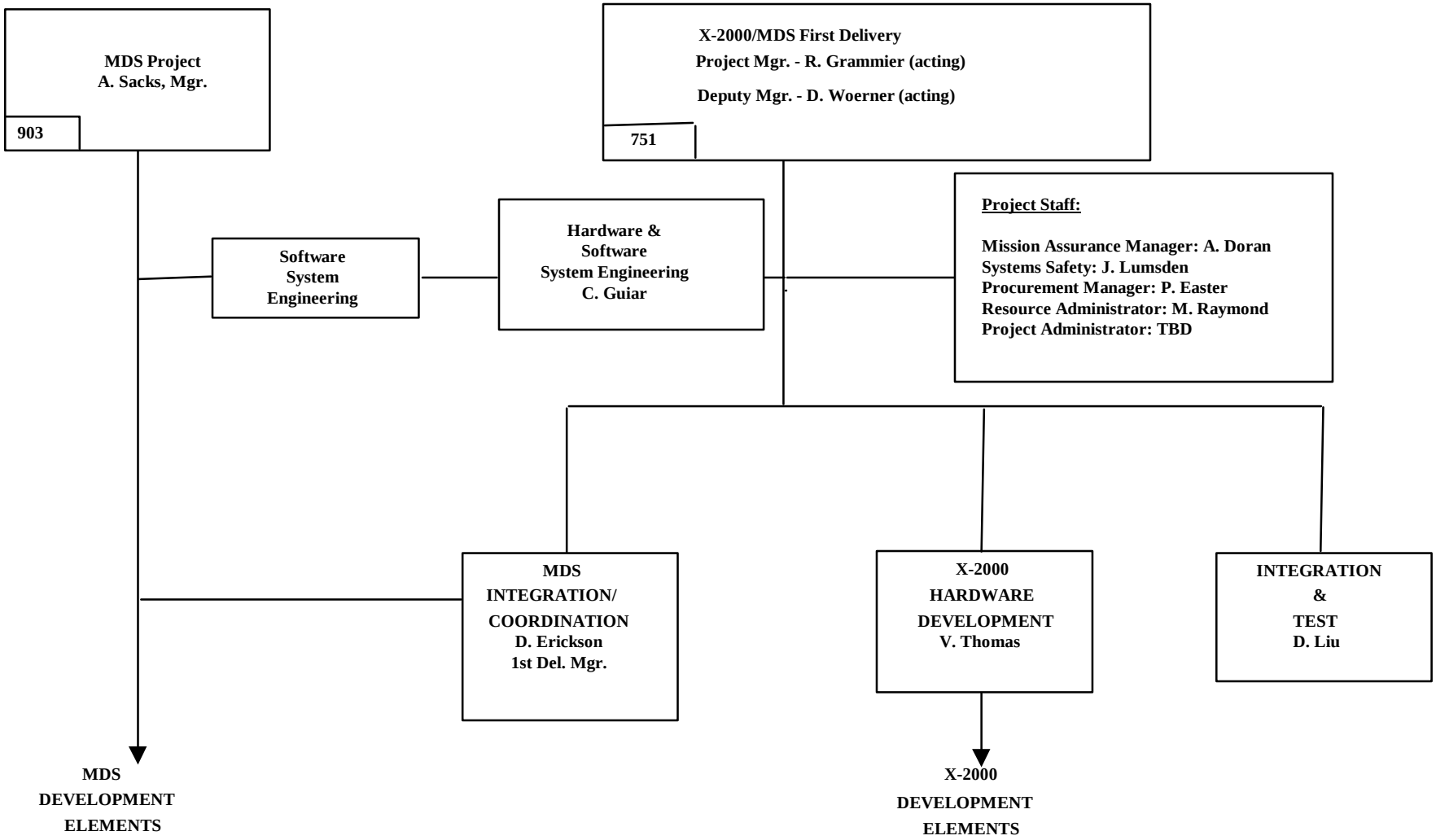
1999 October 22

Outer Planets/Solar Probe Project
Jet Propulsion Laboratory

Note: In the event of differences between information here and in the Deep Space Systems AO, information in the AO and its update and Q&A Web sites should be used for proposal purposes.

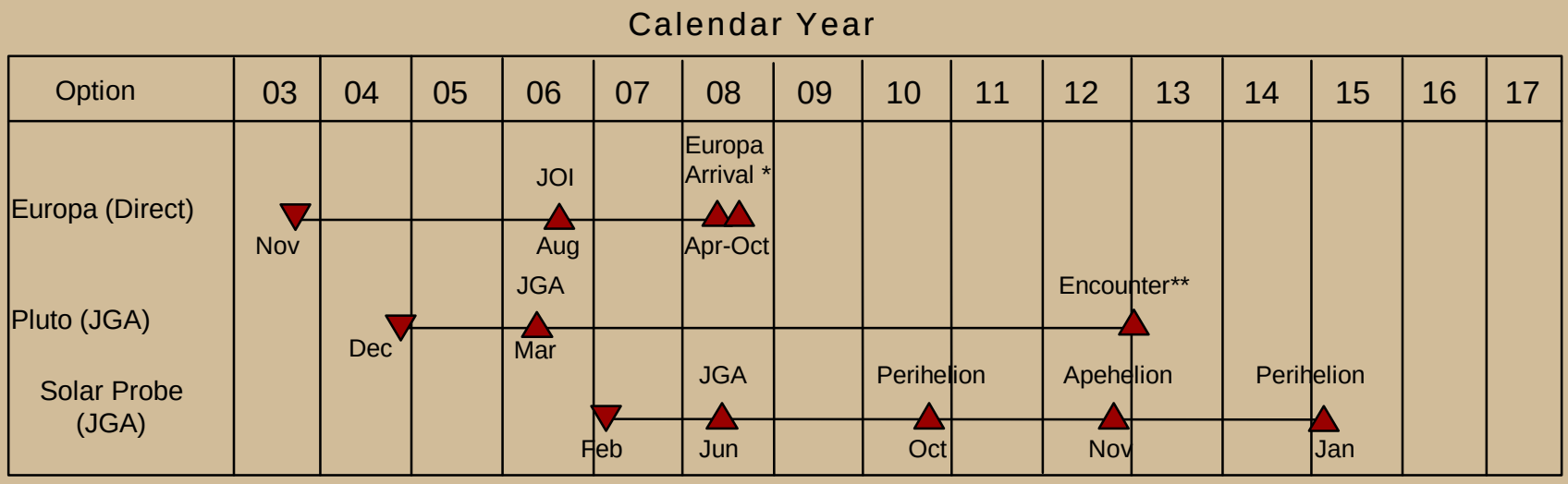

OP/SP PROJECT
Project Manager John McNamee
Deputy Project Manager Rob Staehle
Mission Assistant Steve Brewster
Project Secretary Karen Sampley
Secretary TBA
Chief Scientist
Rich Terrile
Project Engineer
John Klein
Mission Assurance Manager
Rich Kemski
Systems Safety Engineer
Jim Lumsden
Launch System Interface Engineer
Marion Thompson
Launch Approval/NEPA Compliance Engineer
Dawn Skinner
Education & Public Outreach Coordinator
Richard Shope
Contract Administration
Peggy Easter
Steve Alfery
Europa Project Scientist
Torrence Johnson
Pluto Project Scientist
Rich Terrile
Solar Probe Project Scientist
Bruce Tsurutani
Investigation Scientist
Ken Klaasen
Project S/W Engineer
Anne Elson
Technology
Jim Randolph
Planetary Protection
QA
Reliability
Product Assurance
Business Operations Manager
Solar Probe Flight System Manager
EO/Pluto Flight System Manager
Karla Clark
Flight Instrument Development Manager
Young Park
Mission Design Manager
Jan Ludwinski
Mission Operations Manager
John Carraway
Administration
Financial
Walt Boyd
Planning/ Scheduling
Ed Jorgensen
Industry System Contract
Solar Probe Development
EO System Engineer
Curt Henry
STLO Manager
Gaylon McSmith
Pluto System Engineer
Sima Lisman
EO/Pluto Integration & Test Mgr
John Klein
RPS Engineer
Jack Mondt
Avionics PEM
Randy Blue
MTP - PEM
Pam Hoffman
Telecom PEM
Chien Chen

X2000 Organization



Outer Planets/Solar Probe

Key Events



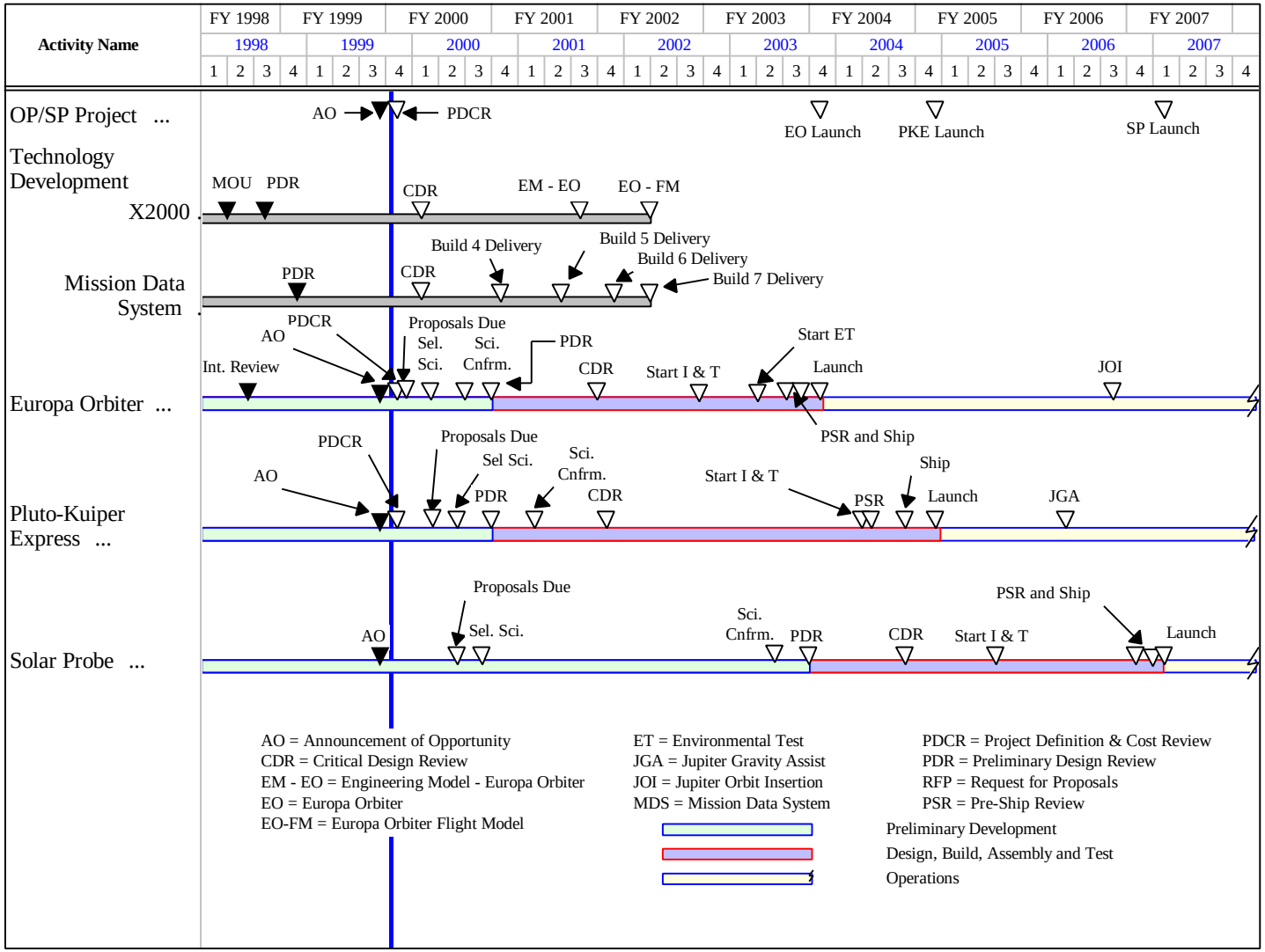
▼ Launch

▲ Arrival (unless otherwise indicated)

* Europa arrival sensitive to trajectory design and launch date

** Pluto arrival sensitive to launch vehicle selection and launch date.

Outer Planets/Solar Probe Project
Preliminary Schedule

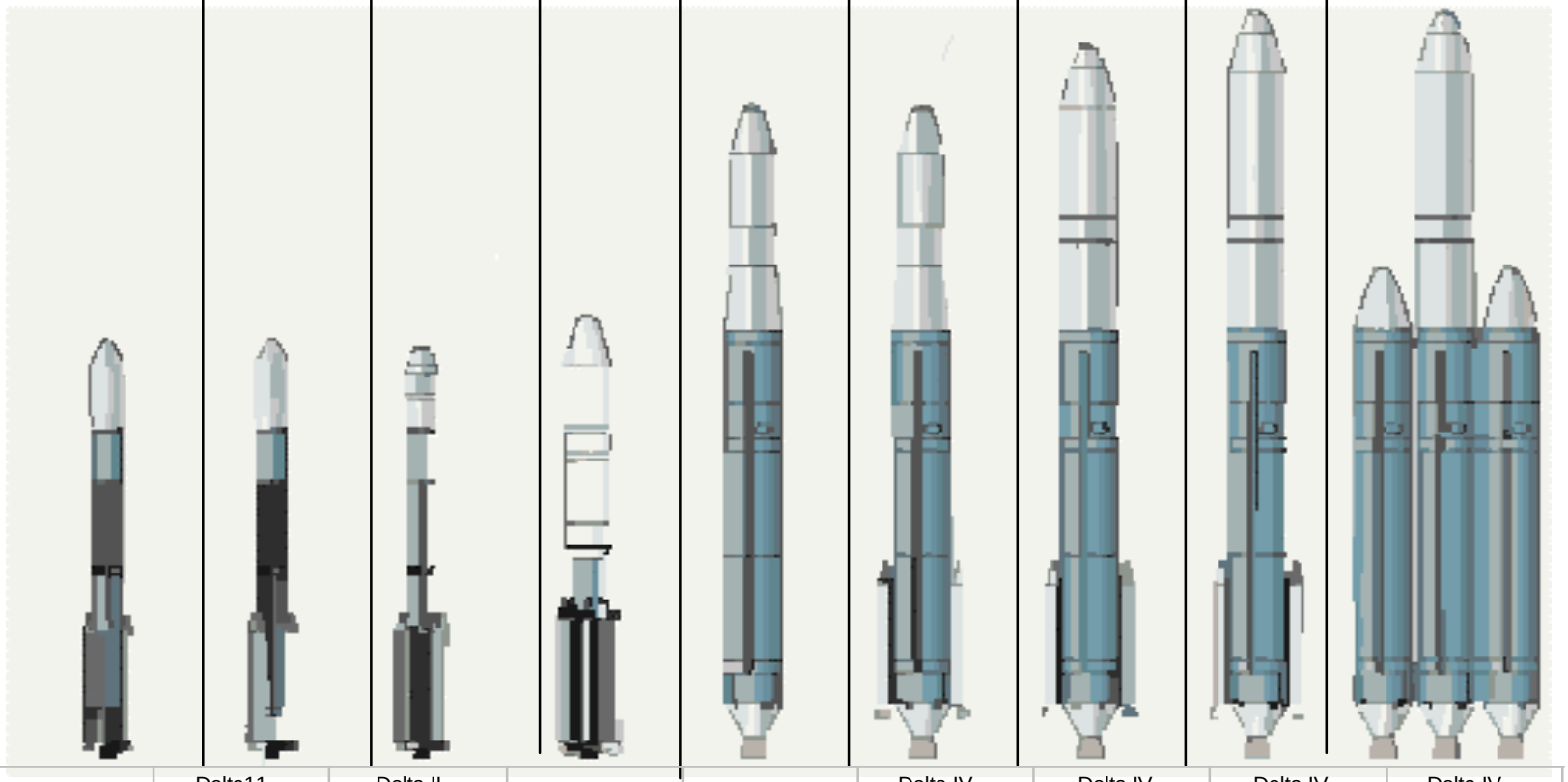


10/19/99 991019_Schedule

Launch Services

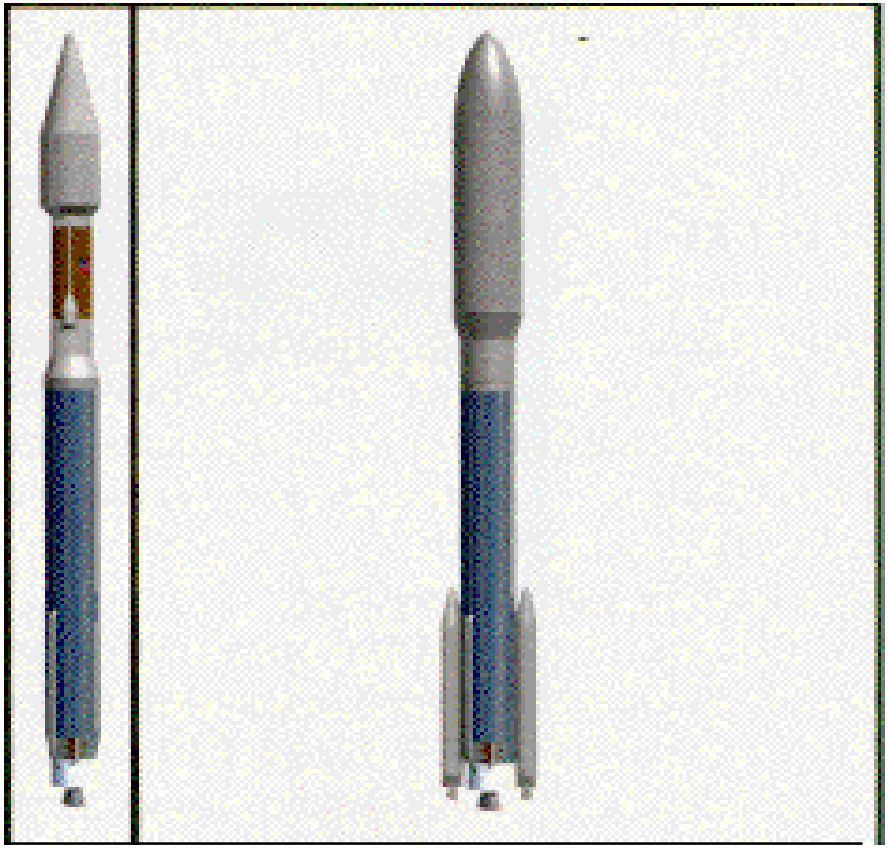
- Launch services for the OP/SP project will include the following:
  - Launch Vehicle
  - Mission Unique Hardware and Services
  - Range Services
  - Payload Processing and Facility Services
- Launch Services competitive procurement is planned as a part of the IDIQ portion of the NASA Launch Services contract on the following schedule:
- OPSP RFP release - 1/01, contract selection 4/01
  - Europa Orbiter Authority to Proceed (ATP) - 4/01
  - Pluto Kuiper Express - ATP - 6/02
  - Solar Probe - ATP - 8/04
- Basic assumption is to procure the same EELV launch vehicle for all three missions in order to save cost (common hardware interface, personnel, procedures and Launch Approval process)

Delta Launch Vehicle Family

Fairing Size	10 feet (3 meters)			13 feet (4 meters)		16.7 feet (5 meters)			
Vehicles									
C_3=0 Km^2/sec^2	Delta II	Delta11 (7425)	Delta II 7925	Delta III	Delta IV	Delta IV M+ (4,2)	Delta IV M+(5,2)	Delta IV M+(5,4)	Delta IV Heavy
	603 kg	785kg	1243kg	2639kg	2731kg	3869kg	2803kg	4180kg	9340kg
C_3=14 Km^2/sec^2	431	576kg	925kg	2054kg	1930kg	2850kg	1940kg	3149kg	7304kg

First Launch 2001

ATLAS V



Atlas V 400	Atlas V 500					
401	501	511	521	531	541	551
Performance to GTO, kg (lb)						
5,000	4,100	4,900	6,000	6,900	7,600	8,200
(11000)	(9,000)	(10,800)	(13,200)	(15,200)	16,700)	(18,000)

First Launch 2001

System Architecture

- 3 Flight Systems with common X2000/MDS avionics + core s/w
  - Europa Orbiter
  - Pluto/Kuiper Express
  - Solar Probe
- Common Mission Software System
  - Inherited from X2000/Mission Data System (MDS) First Delivery Project
  - Adapted and Extended to meet mission unique software needs
- Shared Ground System
  - Operations Control Center
  - Deep Space Network
- 3 Launch Systems
  - TBD Expendable Launch Vehicle for Europa
  - Same Expendable Launch Vehicle for Pluto
  - Same Expendable Launch Vehicle for Solar Probe
  - All 3 Use Star 48V solid rocket motors for interplanetary injection
- 2 Test Systems
  - Shared systems for Europa & Pluto
  - Separate system for Solar Probe (with much inheritance from Europa/Pluto)

System Architecture (Mission Software System)

- All 3 missions will inherit mission software currently under development by the Mission Data System Project:
  - MDS is a unified flight, ground and test software system
  - MDS has state-based, goal-oriented architecture
  - MDS is integrated with existing portions of TMOD external to MDS
  - MDS designed to be easily adapted, extended by users
- All 3 missions will adapt MDS software and add mission unique software
  - Adapted and new software will conform to MDS supplied software architectural framework
  - OP/SP software development will be according to OP/SP Software Management Plan. Plan is an adaptation of MDS SMP
- All 3 missions will use software tools and development environment supplied by MDS

Flight System - OP/SP Hardware

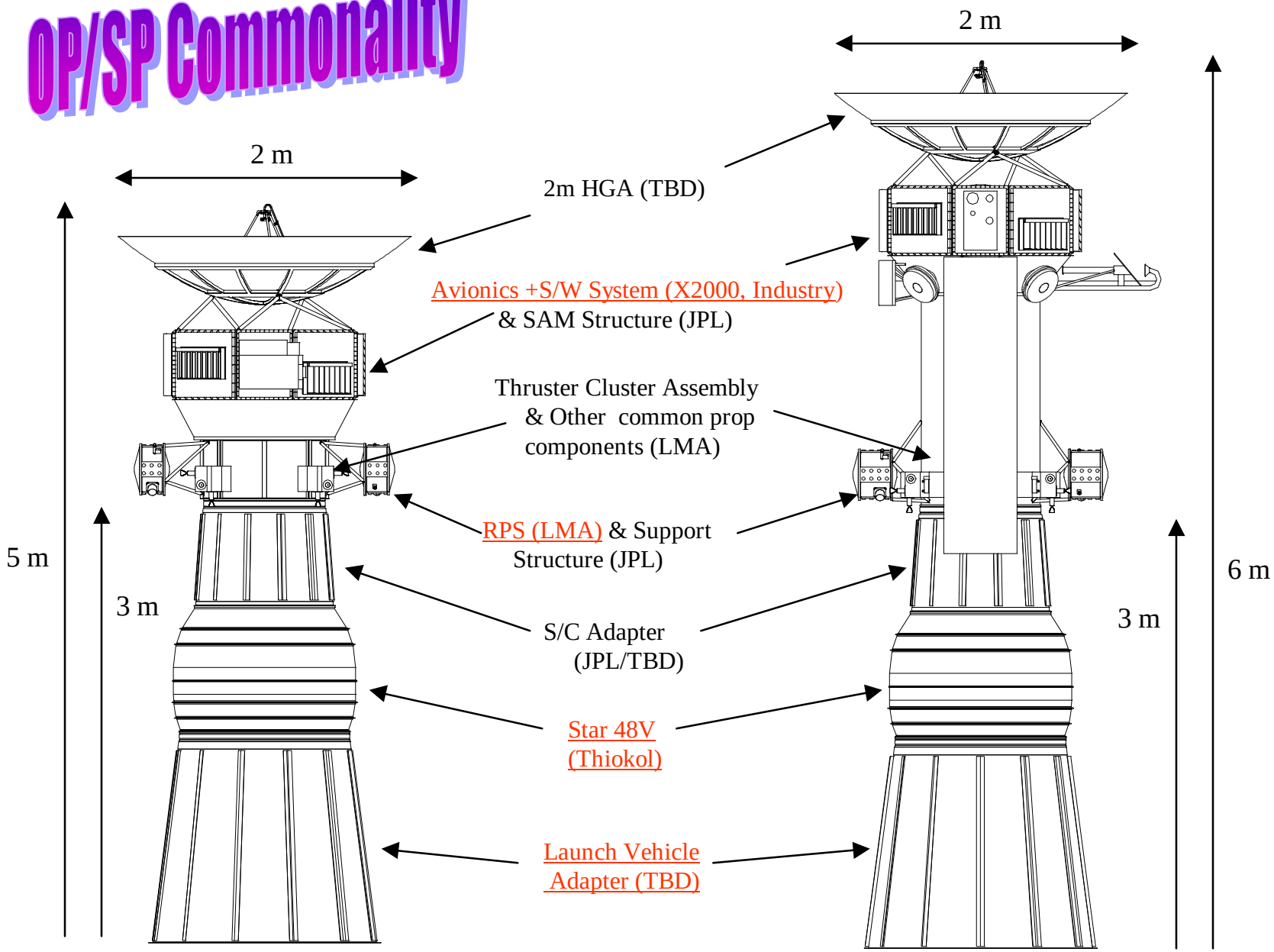
- Other hardware being developed by the OP/SP Project that will be used on multiple missions:
  - Power Sources
    - RPS (all 3), if utilized
    - Battery (all 3*)
  - Telecom Subsystem
    - Antennas (E & PKE)
    - Electronics (all 3*)
  - Attitude Sensors
    - Star tracker (all 3*)
    - Inertial Measurement Unit (all 3*)
    - Sun Sensor (E & PKE)
    - Interface Electronics (all 3*)
  - Propulsion
    - Thruster Clusters (E & PKE)
  - Mechanical Structure (E & PKE)
    - Adapter to Star 48V
    - Adapter between Star 48V & Upper Stage (all 3*)
    - Electronics Bus
    - Miscellaneous Secondary Structure (Brackets, Supports, etc.)

*Actual Solar Probe hardware selection will be up to system contractor to be selected via RFP. Proposers to the AO should assume hardware as described in Program Library documents accessed on-line and any associated updates and answers to questions.

Flight System - OP/SP Hardware

- Europa mission-unique hardware:
  - Instruments
  - Propulsion module
  - Reaction wheels
  - Thermal blankets (some)
  - Cabling (some)
- Pluto mission-unique hardware:
  - Instruments
  - Propulsion module
  - Thermal blankets (some)
  - Cabling (some)
- Solar Probe mission-unique hardware:
  - Instruments
  - Propulsion module
  - High gain antenna/heat shield
  - Structure
  - Thermal blankets
  - Cabling

OP/SP Commonality



Pluto-Kuiper Express

Europa Orbiter

Solar Probe Candidate Commonality in Orange Underline

Solar Probe Example Configuration

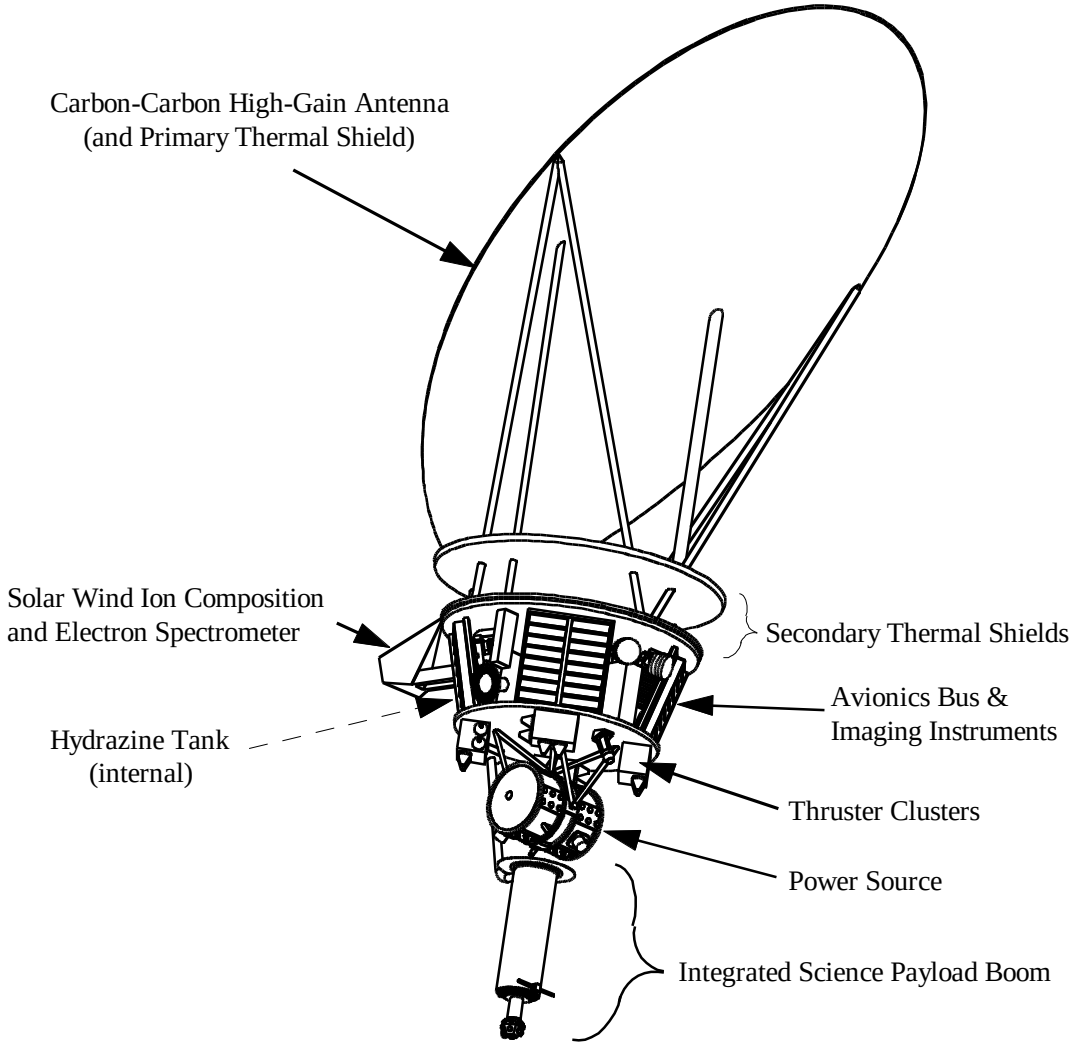
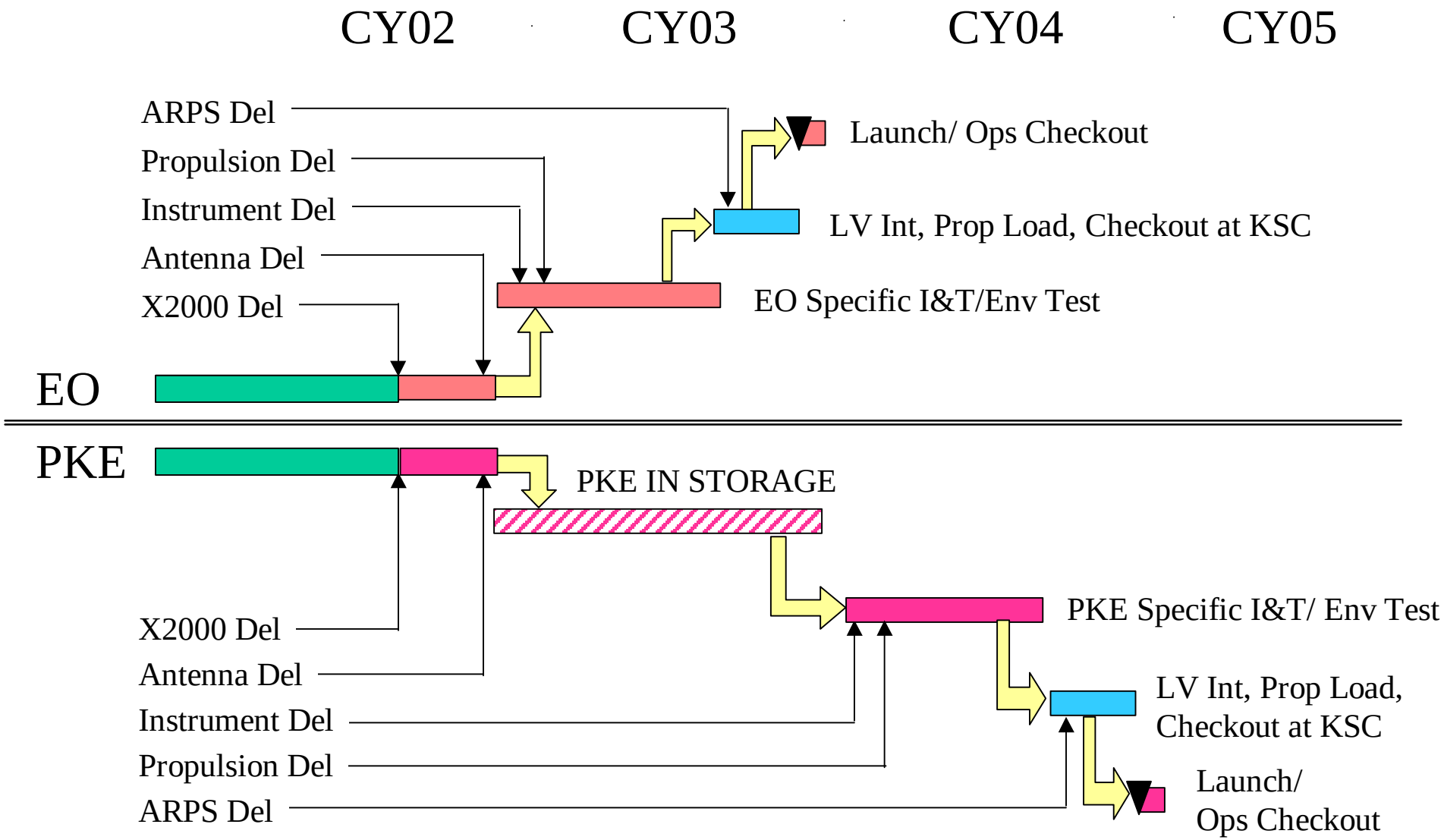


Fig 2 from AO Mission & Project Description, p 14

I&T Approach

- X2000 First Delivery Project integrates Europa Orbiter engineering model (EM) and Flight avionics
- OP/SP takes delivery of EO avionics and begins System Test and Launch Operations (STLO)
- X2000-OP/SP procures and integrates Pluto-Kuiper Express EM and flight avionics
- Multiple testbeds (at least 2) will be maintained for first integration of hardware and software
  - Most likely comprised of engineering model hardware
- EO and PKE flight engineering systems built up together until mission unique items are integrated (propulsion, instruments)

PKE/EO Concurrent Integration



AO and Program Library Changes

- All three missions
  - revision to instrument data interface specification
  - posted Project Outreach Plan
  - revised delivery date milestones
- Europa
  - addition of non-ionizing energy loss radiation environment specification
  - specification of expected radiation dose inside CPCI electronics chassis
  - Planetary Protection document added to posted Library
- Pluto
  - deleted requirement to describe impact of early launch option
  - corrected maximum slew acceleration value
- Solar Probe
  - clarified NASA's right to make partial selections from instrument package proposals
  - improved pointing stability to 100 μrad in 1 sec
  - corrected some assumptions in telecomm analysis; no change to data rate
- Questions & answers
  - answers provided to questions submitted